WHAT IS CLAIMED IS:

1. Apparatus for effecting relative movements of first and second parts at least one of which is turnable relative to the other, comprising:

at least one tracking device fixed relative to said first part;

a helix non-rotatably associated with said second part and having a plurality of convolutions, said tracking device having a portion extending between at least two of said convolutions; and

means for turning said one part relative to said other part.

2. The apparatus of claim 1, wherein said convolutions include at least one package of abutting neighboring convolutions.

3. The apparatus of claim 1, wherein said means for rotating comprises means for rotating said one part clockwise and counterclockwise.

4. The apparatus of claim 1, wherein said helix has a first axis and said second part has a second axis intersecting said first axis within said second part.

5. The apparatus of claim 1, wherein said helix has a first axis and said second part has a second axis coinciding with said first axis.

6. The apparatus of claim 1, wherein said first part is coaxial with said second part.

7. The apparatus of claim 1, wherein said helix has first and second end convolutions, at least one of said end convolutions being non-rotatably secured to said second part.

8. The apparatus of claim 1, wherein said helix comprises first and second end convolutions and an axis, and further comprising an axial abutment provided on said second part to hold one of said end convolutions against movement in the direction of said axis.

9. The apparatus of claim 1, wherein said helix has an axis and two end convolutions, and further comprising means for holding at least one of said end convolutions against movement relative to said second part at least substantially radially of said axis.

10. The apparatus of claim 1, wherein said helix has an axis and said tracking device includes at least one follower abutting at least one of said at least two convolutions in at least one of a plurality of directions including radially of and in the direction of said axis.

11. The apparatus of claim 1, wherein said convolutions include first and second packages of convolutions, said first package including one and said second package including the other of said at least two convolutions.

12. The apparatus of claim 11, wherein each of said packages consists at least in part of abutting convolutions.

13. The apparatus of claim 1, wherein said helix includes a convoluted band.

14. The apparatus of claim 1, wherein said helix has an at least substantially polygonal cross-sectional outline.

15. The apparatus of claim 1, wherein said convolutions have a common axis and said helix has an at least substantially rectangular cross-sectional outline.

16. The apparatus of claim 15, wherein said cross-sectional outline has a width and a thickness as measured, respectively, radially of said axis and in the direction of said axis, said width exceeding said thickness.

17. The apparatus of claim 16, wherein said width is between about three and sixty times said thickness.

18. The apparatus of claim 1, wherein said convolutions have a common axis and a thickness less than 5 mm as measured in the direction of said axis.

19. The apparatus of claim 18, wherein said thickness is less than 2 mm.

20. The apparatus of claim 1, wherein said helix, said device and said rotating means form part of an axial drive, said helix having an outer diameter and each of said convolutions having a width, as measured radially of a common axis of said convolutions, the ratio of said outer diameter to said width being in the range of between about 100:1 and 1:1.

21. The apparatus of claim 20, wherein said ratio is between about 30:1 and 5:1.

22. The apparatus of claim 1, wherein said parts, said helix, said device and said rotating means form part of an axial drive, said helix having an outer diameter and each of said convolutions having a thickness as measured in the direction of a common axis of said convolutions, the ratio of said outer diameter to said thickness being in the range of between about 700:1 and 25:1.

23. The apparatus of claim 22, wherein said ratio is between about 200:1 and 40:1.

24. The apparatus of claim 1, wherein the convolutions of said helix have one of a plurality of cross-sectional outlines including a polygonal and an at least substantially circular outline.

25. The apparatus of claim 1, wherein said helix consists of a resilient material.

26. The apparatus of claim 25, wherein said resilient material is selected from the group consisting of spring steel, a plastic substance and a ceramic substance.

27. The apparatus of claim 1, wherein said helix has between three and 300 convolutions.

28. The apparatus of claim 27, wherein the number of said convolutions is between about five and fifty.

29. The apparatus of claim 1, wherein said helix and said tracking device cooperate to move at least one of said first and second parts axially of the other of said first and second parts in response to rotation of said one part relative to said other part.

30. The apparatus of claim 1, wherein said device is arranged to track said helix by contacting successive increments of successive convolutions of said plurality of convolutions in response to rotation of said one part relative to said other part.

31. The apparatus of claim 1, wherein said rotating means includes means for rotating said one part clockwise and counterclockwise, said device including at least one first follower arranged to track the convolutions of said helix in response to clockwise rotation of said one part and at least one second follower arranged to track the convolutions of said helix in response to counterclockwise rotation of said one part.

32. The apparatus of claim 1, wherein said device includes at least one first follower and at least one second follower, said helix including a portion disposed between said first and second followers.

33. The apparatus of claim 1, wherein said convolutions have a common axis and said device includes at least one first follower and at least one second follower spaced apart from said at least one first follower as seen in the direction of said axis, said helix having a portion disposed between said first and second followers.

34. The apparatus of claim 1, wherein said convolutions have a common axis and said device includes a plurality of followers including first and second helix-contacting followers spaced apart from each other in the direction of said axis, said helix being in simultaneous contact with said first and second followers.

35. The apparatus of claim 1, wherein said convolutions have a common axis and a predetermined thickness as measured in the direction of said axis, said device including first and second followers arranged to track said helix and being spaced apart from each other in the direction of said axis a distance at least approximating said thickness.

36. The apparatus of claim 35, wherein said helix has a portion contacting said followers and dividing said convolutions into a first package and a second package of neighboring convolutions, the number of convolutions in one of said packages increasing and the number of convolutions in the other of said packages decreasing in response to rotation of said one part relative to said other part.

37. The apparatus of claim 1, wherein said rotating means includes means for selectively rotating said one part clockwise and counterclockwise, said device including a first set of followers tracking said helix in response to clockwise rotation of said one part and a second set of followers tracking said helix in response to counterclockwise rotation of said one part.

38. The apparatus of claim 1, wherein said convolutions have a common axis and said device includes a plurality of substantially pin-shaped followers spaced apart from ech other in the direction of said axis and circumferentially of said helix.

39. The apparatus of claim 38, wherein said device comprises between three and twelve followers.

40. The apparatus of claim 1, wherein said convolutions have a common axis and said device includes a plurality of followers carried by said first part and extending across the width of said at least two convolutions as seen radially of said axis.

41. The apparatus of claim 1, wherein said device comprises at least one follower including a bearing contacting at least one of said at least two convolutions.

42. The apparatus of claim 41, wherein said bearing is one of bearings including friction bearings and roller bearings.

43. The apparatus of claim 1, wherein said device includes at least one pin-shaped follower rotatably mounted in said first part.

44. The apparatus of claim 1, wherein said device includes at least one substantially pin-shaped follower arranged to engage at least one of said at least two convolutions and at least one bearing rotatably mounting said at least one follower in said first part.

45. The apparatus of claim 1, wherein one of said parts is at least partially surrounded by the other of said parts.

46. The apparatus of claim 1, wherein said second part is surrounded by said first part.

47. The apparatus of claim 1, wherein said helix is at least partially surrounded by one of said parts and at least partially surrounds the other of said parts.

48. The apparatus of claim 1, wherein said device comprises at least one ramp provided in said first part and extending circumferentially of said helix.

49. The apparatus of claim 48, wherein said at least one ramp has a recess for a portion of said helix.

50. The apparatus of claim 48, wherein said helix has a first lead and said at least one ramp has a second lead at least approximating said first lead.

51. The apparatus of claim 1, wherein said second part has at least one segment-shaped or circumferentially complete thread-shaped recess, said at least one tracking device comprising a plurality of rolling elements disposed in said recess and said recess having an end portion at which said rolling elements are introduced into a starting point of said thread-shaped recess.

52. The apparatus of claim 51, wherein said thread-shaped recess further comprises a starting portion and said rolling elements are guided, in the region of transition from the starting and end portions, into a path expanding radially outwardly of the radius of said spiral.

53. The apparatus of claim 51, wherein the paths of said helix and said recess cross each other.

54. The apparatus of claim 51, wherein at least one of said rolling elements is barrel-shaped.

55. The apparatus of claim 51, wherein said rolling elements have peripheral surfaces in rolling contact with one of said helix and a surface surrounding said recess.

56. The apparatus of claim 1, wherein said first and second parts have a common axis, and further comprising means for biasing said parts axially against each other.

57. The apparatus of claim 1, further comprising means for biasing said parts in the direction of action of the apparatus.

58. The apparatus of claim 1, wherein said parts have a common axis, and further comprising energy storing means arranged to bias said parts in at least one of the directions including axially and radially of said axis, said parts being prestressed counter to the direction of bias of said energy storing means.

59. The apparatus of claim 1, further comprising energy storing means for biasing one of said parts relative to the other of said parts, said energy storing means comprising one of a spiral and a helix.

60. The apparatus of claim 1, wherein said helix cooperates with said tracking device to move one of said first and second parts axially in response to turning of said one part, said helix being prestressed and being affixed to said first and second parts, said tracking device dividing the convolutions of said helix into first and second packages of abutting convolutions.

61. The apparatus of claim 1, wherein said helix cooperates with said tracking device to move one of said first and second parts axially in response to turning of said one part, and further comprising a plurality of energy storing elements arranged to bias said parts relative to each other, each of said energy storing elements including a leaf spring having a first end portion connected to one of said parts and a second end portion connected to the other of said parts, said leaf springs being spaced apart from each other in a circumferential direction of said helix.

62. The apparatus of claim 1, further comprising at least one coil spring arranged to bias one of said parts axially of the other of said parts.

63. The apparatus of claim 62, wherein said coil spring has a longitudinal axis and is self-centering in the direction of said longitudinal axis.

64. The apparatus of claim 1, wherein said helix, said turning device and said means for turning are arranged to move one of said parts axially and said helix has an axial profile.

65. The apparatus of claim 64, wherein said profile is an at least substantially V-shaped profile.

66. The apparatus of claim 65, wherein said profile has a ridge facing counter to the direction of action of said helix.

67. The apparatus of claim 1, wherein said turning means cooperates with said helix and with said tracking device to effect an angular displacement of said parts relative to each other.

68. The apparatus of claim 1, wherein said turning means comprises means for rotating said one part relative to said other part.

69. The apparatus of claim 1, further comprising a housing having a third part which is stationary relative to said one part.

70. The apparatus of claim 1, wherein said one part has an axis and said turning means includes means for rotating said one part about said axis.

71. The apparatus of claim 1, wherein said means for turning comprises at least one electric motor.

72. The apparatus of claim 1, wherein said means for turning comprises a turbine, such as a compressed air turbine.

73. The apparatus of claim 1, wherein said one part has a first radial dimension and said means for turning has a second radial dimension less than said first dimension.

74. The apparatus of claim 1, wherein parts include a radially inner part and a radially outer part, said means for turning being disposed within said radially outer part.

75. The apparatus of claim 74, wherein said one part is one of said radially inner and radially outer parts.

76. The apparatus of claim 1, wherein said second part is movable to and from at least one end position, and further comprising an abutment arranged to arrest said second part in said at least one end position.

77. The apparatus of claim 76, wherein said abutment includes at least one cushion effective in at least one of a plurality of directions including axially and circumferentially of said second part.

78. The apparatus of claim 1, further comprising at least one stop arranged to limit the extent of turnability of said one part relative to said other part.

79. The apparatus of claim 78, wherein said means for turning includes an electric motor and said stop forms part of said motor.

80. The apparatus of claim 1, further comprising at least one sensor arranged to monitor the extent of axial displacement of one of said parts.

81. The apparatus of claim 80, wherein said sensor is an incremental sensor.

82. The apparatus of claim 80, wherein said sensor is arranged to monitor the maximum extent of axial movement of one of said parts.

83. The apparatus of claim 1, wherein said first part is surrounded by said second part and has a central opening.

84. The apparatus of claim 83, further comprising a shaft received in said opening, said means for turning being mounted on said shaft.

85. The apparatus of claim 1, wherein said one part includes a rotary shaft and said turning means is non-rotatably associated with said shaft, said one part being braked by a stationary housing.

86. The apparatus of claim 1, wherein said one part is force-lockingly connectable with a rotary element and said other part is force-lockingly connectable with a fixed housing.

87. The apparatus of claim 1 further comprising a shaft rotatable in a single direction and connected with said one part.

88. The apparatus of claim 1 wherein, for the purpose of actuating the apparatus in a first axial direction, the other part is non-rotatably affixed to a shaft and the one part is braked against a housing whereas, for the purpose of actuating the apparatus in a second axial direction, said one part is non-rotatably affixed to the shaft and the other part is braked against the housing.

89. The apparatus of claim 88, wherein at least one of said affixing and said braking is effected by at least one electromagnet and/or by at least one fluid-operated slave cylinder associated with a source of pressurized fluid.

90. The apparatus of claim 1, wherein said means for turning has a central opening and further comprising a shaft extending through said opening and being associated with one of said first and second parts.

91. The apparatus of claim 1, wherein said means for turning comprises a rotor and one of said first and second parts is integrated into said rotor.

92. The apparatus of claim 91, wherein the other of said first and second parts is integrated into a housing of said means for turning.

93. The apparatus of claim 91, further comprising a shaft, said means for turning being rotatably or non-rotatably mounted on said shaft.

94. The apparatus of claim 1, wherein said one part is arranged to act upon an axially movable component at a variable angular speed, and further comprising an antifriction bearing between said one part and said component.

95. The apparatus of claim 94, wherein said antifriction bearing is mounted on said one part.

96. The apparatus of claim 1, further comprising first and second machine components, at least one of said first and second parts being arranged to move one of said components relative to the other of said components in at least one of directions including (a) in the direction of an axis of said one component and (b) at least substantially radially of said axis.

97. The apparatus of claim 1, further comprising a collet chuck arranged to radially clamp workpieces and to receive motion from at least one of said first and second parts.

98. The apparatus of claim 1, further comprising first and second shafts and first and second pulleys non-rotatably mounted on said first and second shafts, respectively, at least one of said pulleys having a variable diameter and at least one of said first and second parts being arranged to vary the diameter of said at least one pulley.

99. The apparatus of claim 98, further comprising a variable-length endless flexible element trained over said pulleys and means for varying the length of said flexible element.

100. The apparatus of claim 1, further comprising an engageable and disengageable friction clutch having a first rotary shaft coaxial with said parts, first and second pressure plates non-rotatably mounted on said first shaft, one of said pressure plates being movable axially of said shaft and further comprising a second rotary shaft coaxial with said first shaft, a clutch disc between said pressure plates, and adjustable resilient means carried by said second shaft and arranged to bias said one pressure plate against said clutch disc and thus against said other pressure plate, one of said first and second parts being arranged to adjust said resilient means to thus select the extent of engagement of said clutch.

101. The apparatus of claim 1, further comprising a combustion engine having an output shaft, a second shaft coaxial with said output shaft, and an engageable and disengageable friction clutch between said shafts, said clutch being coaxial with said parts and including a component movable in the direction of the common axis of said shafts by at least one of said parts to thus change the extent of engagement of said clutch.

102. The apparatus of claim 101, wherein said parts are mounted on said second shaft.

103. The apparatus of claim 1, further comprising a first rotary shaft, a prime mover arranged to drive said first shaft about an axis, a split flywheel including a first flywheel mounted on said first shaft, a second flywheel coaxial with and rotatable relative to and jointly with said first flywheel, means for yieldably opposing rotation of at least one of said first and second flywheels relative to the other of said first and second flywheels, a second shaft coaxial with said first shaft, and an engageable and disengageable friction clutch between said second flywheel and said second shaft, one of said parts being arranged to change the extent of engagement of said clutch.

104. The apparatus of claim 1, further comprising control means for said turning means.

105. The apparatus of claim 104, wherein said control means includes at least one sensor arranged to transmit signals and means for adjusting said turning means in response to said signals.

106. The apparatus of claim 105, wherein said at least one sensor is arranged to transmit signals in response to changes of at least one of a plurality of parameters including (a) the RPM of a rotary component, (b) a distance covered by a rotary component, (c) changes of speed of a rotary component, (d) a change of force, and (e) at least one further parameter derivable from at least one of said parameters (a) to (d).

107. The apparatus of claim 1, further comprising an automated friction clutch for use in a motor vehicle and a control system for said clutch, at least one of said parts being arranged to adjust said clutch in response to signals denoting changes of at least one variable parameter furnished by at least one sensor forming part of said control system and arranged to monitor at least one of (a) the RPM of at least one driven wheel of a motor vehicle embodying said clutch, (b) the RPM of at least one non-driven wheel of the vehicle, (c) the position of the flap of the throttle valve in the engine of the vehicle, (d) the speed of the vehicle, (e) the RPM of the transmission in the vehicle, (f) the RPM of the engine, (g) acceleration of the vehicle, (h) transverse acceleration, (i) signal from wheel

blocking means, (j) selected speed ratio of the transmission, (k) the magnitude of torque being transmitted by the clutch, (l) the temperature of the clutch, (m) the temperature of lubricant in the transmission, (n) the temperature of lubricant in the engine, and (o) the angular position of the steering wheel.

108. Apparatus for effecting relative axial movements, comprising:

first and second parts at least one of which is rotatable relative to the other about an axis common to said first and second parts;

at least one tracking device fixed relative to said first part as seen in the direction of said axis;

a helix non-rotatably associated with said second part and having a plurality of convolutions, said tracking device having a portion extending between at least two of said convolutions; and

means for rotating said at least one part relative to said other part.

109. Apparatus for effecting relative radial movements, comprising:

first and second parts at least one of which is rotatable relative to the other thereof about a predetermined axis;

at least one tracking device axially fixed relative to said first part;

a helix non-rotatably associated with said second part and having a plurality of convolutions, said tracking device having a portion extending between at least two of said convolutions; and

means for rotating said at least one part relative to said other part.

110. A machine element for continuously maintaining two machine parts in spaced-apart positions, including an apparatus arranged to move one of the machine parts relative to the other machine part in at least one of a plurality of directions including radially and axially.